DKU DEUTSCH KASACHISCHE UNIVERSITÄT

Leibniz-Institut für Agrarentwicklung in Transformationsökonomien

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Climate Vulnerabilities in Central Asia: Universities and Policy Mainstreaming

Main Findings

Universities and academia in Central Asia play a crucial role in addressing climate change impacts, including rising temperatures, diminishing water resources, and increased frequency of extreme weather events threatening agriculture and livelihoods. Academic efforts must prioritize research on tailored adaptation strategies to foster resilience and sustainability. However, there's an underrepresentation of climate change research from Central Asia, emphasizing the urgent need for expanded research efforts.

Introduction

Central Asia is grappling with multifaceted challenges across various sectors of national economies exacerbated by climate change. Tackling this issue demands an integrated adaptation strategy that acknowledges the intricate interconnections between sectors and the varied impacts of climate change. This policy brief aims to outline the critical role of educational and research institutions in formulating effective climate change adaptation policies and to provide recommendations for enhancing their involvement in climate change adaptation efforts. Education and research institutions should play a key role in facilitating the development of integrated multi-stakeholders' adaptation strategies that consider the complex linkages between various sectors affected by climate change. These strategies should be informed by comprehensive rationales and forecasts provided by knowledge centers, considering the socio-economic stability and environmental sustainability of the region.

Climate changes trends and Advancing Climate Resilience in Central Asia

Central Asia is confronting significant challenges due to climate change, with its vulnerability stemming from its physical geography, the importance of agriculture, and economic shifts since independence. The region has experienced marked temperature increases in recent decades, while mean precipitation has remained relatively stable. Projections suggest that by 2050, average temperatures could rise by 2.4-3.0°C, leading to exacerbated water scarcity, desertification, and reduced agricultural productivity, thereby impacting food security and export potential (Siegfried at al., 2012; Lioubimtseva and Henebry, 2009). The disappearance of snow, glaciers, and ice sheets, particularly in the Pamir and Tien Shan Mountain ranges, further compounds these challenges, increasing the risk of glacial lake outbursts and contributing to conditions conducive to wildfires and biodiversity loss (IPCC, 2022; IPBES, 2021; Sabyrbekov et al., 2023).

Economic impacts are significant, with drought events posing the highest risks in terms of macroeconomic impacts, affecting sectors such as agriculture, household spending, employment, and GDP. Economic modeling (World Bank, 2023) suggests that droughts could lead to a decrease in GDP (up to 2.4%), household consumption (up to 2.04%), agricultural production (up to 10.64%), and employment rates (up to 1.4% annually). Increased severity and frequency of heatwaves are expected to lower wheat yields and pasture productivity, while extreme precipitation events could primarily impact the economy and employment through infrastructure damage. To address these challenges, Central Asian countries must develop and implement sustainable climate

change adaptation strategies that consider environmental, social, and economic criteria. Strategies include improving food security, introducing innovative technologies, reinventing traditional land management systems, and investing in irrigation infrastructure and digitalization (World Bank, 2021; Polo et al., 2022). Replacing the existing open irrigation canal network with more efficient drip irrigation systems can significantly reduce water loss, improve crop yields, reduce soil salinity, and mitigate water pollution risks. Investments in rehabilitating irrigation infrastructure can contribute to higher GDP, increased household expenditures, and reduced import needs, while digitalization in the irrigation network and precision agriculture technologies can enhance water conservation and increase yield (World Bank, 2023; Polo et al., 2022).

Afforestation offers both adaptation and mitigation benefits by reducing wind impact and sequestering greenhouse gas emissions. Sustainable land management is crucial for supporting the resilience of rangelands. Investment in resilience could yield triple dividends from avoided losses, induced economic or development benefits, and additional social and environmental benefits of adaptation actions, with a large subset of investments also promoting decarbonization.

The Crucial Role of Education and Research Institutions

Education and research institutions play a pivotal role in developing effective climate change adaptation policies by preparing students and society to actively contribute to mitigation and adaptation efforts. They also serve as knowledge centers, providing comprehensive rationales and forecasts for possible developments. Universities are increasingly recognizing their responsibility to address climate change in their curricula, though improvements are needed, as not all are fully prepared. Some initiatives are being taken to develop climate change university curricula. In particular, the New Uzbekistan University (NewUU) emphasizes on interdisciplinary teaching that prepares students for the challenges of climate change. Overcoming barriers such as limitations in teaching staff training is essential for successful integration of climate change education.

Vakulchuk et al. (2022) and Mirzabaev (2023) highlight a critical gap in climate change research in Central Asia, emphasizing the urgent need for expanded research efforts. Despite the growing threat of climate change to the region's socio-economic stability and environmental sustainability, climate change remains significantly underrepresented in academic studies and policy discussions. Vakulchuk et al. (2022) identify a lack in literature and conference discussions focusing on climate change in Central Asia, with a dominance of support from Chinese government organizations and European science funders for publications on climate change in the region. However, national science donors from Central Asian countries, apart from Kazakhstan, are not prominently represented among the donors for publications in reputed international journals.

Mirzabaev (2023) builds on this by presenting an in-depth analysis of the current state of climate science in the region, emphasizing the necessity for increased investment in climate change research, particularly within the social sciences, to facilitate effective adaptation strategies. Both publications call for a concerted effort to enhance data access, develop local climate modeling capacities, and foster regional scientific exchanges to address the multifaceted impacts of climate change in Central Asia. Furthermore, while the climate data collection and analysis infrastructure exist, regional researchers lack consistent efforts to collect data at the household level on climate impact and adaptation. Such micro-level datasets, especially repeatedly collected over a longer time horizon, can be crucial for evidence-based policymaking for better adaptation to climate change. Moreover, there is an insufficient analysis of the impacts of climate change on agriculture, ecosystems, and water resources in Central Asia. Additionally, research on the effectiveness of adaptation measures to climate change across agriculture and other economic sectors is notably scarce.

Recommendations for Research and Policy Integration in Central Asia

To contribute to strengthening the role of research institutes and to inform and guide policymakers on enhancing climate change

adaptation in Central Asia, the following recommendations are proposed:

1. Increase investment in climate change research: National governments and international funding organizations should significantly increase their financial commitment to climate change research. Sustainable funding models should be established to ensure long-term investment in climate science, enabling researchers to undertake extensive studies along longer academic career path on adaptation to climate change. This could be informed by DKU experience of collaborations with the GEF-UNDP-UNESCO Cryosphere Project and the ICWRGC.

2. Strengthen local research capacities: Bolstering local research capacities through substantial investments in education, training programs, and research infrastructure is imperative. This development will empower local scientists to conduct rigorous climate change research, contributing valuable insights specific to the Central Asian context, such as DKU's master's program in Integrated Water Resources Management.

3. Promote collaboration and data sharing: Encouraging collaborative research projects between Central Asian research institutes and international counterparts can lead to a fruitful exchange of knowledge, resources, and innovative practices in climate change adaptation, thus multiplying the research capacities and better connecting the regional researchers to the global community. Such partnerships are crucial for leveraging global expertise to address local challenges effectively. Efforts should be made to enhance data access and foster regional scientific exchanges. This includes developing partnerships between research institutions in Central Asia and international counterparts to facilitate knowledge sharing and collaboration on climate change research. Collaborations, like those between DKU and the World Bank, was focused on innovative solutions in water use, agriculture, and economic impacts.

4. Address underrepresentation in academic studies and policy discussions: There is a pressing need to address the underrepresentation of climate change research from Central Asian countries in academic studies and policy discussions. Efforts should be directed towards promoting and supporting research initiatives from donors within the region to ensure a more diverse and inclusive representation in reputable international journals and conferences. Research institutes should prioritize studies that have direct implications for policy formulation and implementation. By aligning research objectives with the specific adaptation needs of Central Asian countries, the scientific community can directly contribute to the development of effective, evidence-based climate policies.

5. Support open access and dissemination of research findings: Advocating for the open publication and dissemination of research findings is essential to ensure that valuable knowledge on climate change adaptation is accessible to a broad audience, including policymakers, practitioners, and the public beyond Central Asia. By making research findings accessible, it increases the likelihood of international and local media coverage, raising awareness about the specific challenges and adaptation strategies relevant to the region. This awareness is vital for fostering public support for necessary policy changes and encouraging individual and community-level adaptation actions. An informed public is more likely to participate in sustainable practices and support initiatives aimed at mitigating climate change impacts.

6. Introduce interdisciplinary courses and ensure the incorporation of climate adaptation modules across all degree programs: Central Asia's climate challenges demand a skilled workforce in climate adaptation to tackle immediate crises and prepare for long-term changes. Interdisciplinary courses can equip students with skills to address these challenges, focusing on water management, resilient agriculture, disaster risk reduction, biodiversity conservation, and climate policy. By incorporating current scientific research and case studies, students gain practical knowledge to mitigate climate impacts and promote sustainability. This approach fosters a new generation of professionals capable of

navigating complex climate-related issues and fostering resilience in Central Asia

Authors:

Zhakenova Saltanat https://orcid.org/0009-0009-7843-2747

Arsen Tleppayev https://orcid.org/0000-0001-9754-3383

Nodir Djanibekov https://orcid.org/0000-0002-8249-4926

Viktoriya Krylova https://orcid.org/0000-0002-7811-5161

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